Jean Claude Laguerre et al., J Food Process Technol 2017, 8:9(Suppl)
DOI: 10.4172/2157-7110-C1-068

An iconographic correlation method for optimizing a combined microwave/hot air drying of apple *Malus domestica* Sp.

Jean Claude Laguerre[1], Ratovoarisoa L G[1], Vivant A C[2], Gadonna J P[1] and **Jouquand C[1]**
[1]UniLasalle, France
[2]Les ReToques, France

Fruits and vegetables are the main source of food wastes. In France, apples are the most common fruits that are discarded when they are out of caliber, thus it seems relevant to find techniques able to valorize and conserve them so that they are not rejected as wastes at early stage. We show here the optimization of a combined drying technique microwave/hot air (MWHA) for apple *Malus domestica* sp. in terms of energy consumption, physico-chemical and organoleptic properties. The apples were cultivated in a farm located at 55 km northern Paris (France). The MWHA drying was performed in a multi-energy oven air-o-speed®. The optimization approach was the iconographic correlation (CORICO) that provides original models connecting the studied responses to the experimental design factors thanks to several logical interactions between factors. The factors were: specific microwave power (SPi: 1 to 1.5 W/g), maximum specific microwave power (SPmax: 4.91 to 7.02 W/g), hot air temperature (THA: 40 to 50°C), drying duration (d: 180 to 540 minutes), sample thickness (T: 15 to 27mm). The responses of experimental design were: final humidity dry basis (X), water activity (aw), specific energy consumption (SEC in kWh/kg), crispness evaluated by means of a penetration test with a TA.XT plus Texture Analyser , colorimetric values of dried apples: lightness (L*), the chroma (C*), and the hue angle (h). The organoleptic properties measured were fresh apple flavor, acidity, crispness and off-flavors. CORICO provided models giving good accuracy for most of the responses ($0,89 < R2 < 0,99$). Optimal conditions were determined to minimize energy consumption, final humidity, off-flavors and to maximize other organoleptic characteristics. The validation of the optimal conditions found confirmed that the models were accurate and predictable.

Biography

Jean Claude Laguerre has been working as Faculty at UniLaSalle since 1991. He obtained his PhD diploma in Process Engineering (1991) from ENSIA of Massy France (currently AgroParisTech). From 1995 he is the Coordinator of the specialty "Industrial organization in the agro-food industry" which is dedicated to the 5th year Agriculture students at UniLaSalle. He teaches various courses in the field of agro-food processes. He is Member of the research unit "Transformation and Agro-resources" at UniLaSalle. His research activities focus on thermal and microwave processes. He has participated in several European research programs as Task Manager or Scientific Leader. He regularly collaborates with food companies by helping them to develop and/or optimize their processes. He is co-author of 15 articles published in peer reviewed journals and 17 papers presented in international conferences. Up to date he has supervised or co-supervised 1 Postdoctoral Fellow, 3 PhD students as well as 9 MSc students.

jean-claude.laguerre@unilasalle.fr

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